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Microbiological Profile and Antibiogram of Gram Negative Bacilli Isolated from Catheter Associated Urinary Tract Infection (CAUTI) in Intensive Care Units of a Tertiary Care Hospital

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A B S T R A C T

Aim of the study was to isolate and characterize Gram negative bacilli causing urinary tract infections in catheterized patients of either sex and above 19 years of age in intensive care units and to study the antimicrobial sensitivity pattern of the urinary isolates. Total of 100 catheterised patients in Intensive care units were analysed retrospectively and prospectively in a period of 1 year from December 2012 to November 2013 to assess the urinary tract infections caused by indwelling catheter. Of 100 cases, 26 showed catheter associated urinary tract infections. Out of them 11 were *E. coli*, 5 each for *Klebsiella* spp and *Pseudomonas aeruginosa*, 2 were *Citrobacter* spp, and one case each for *Enterobacter* spp, *Acinetobacter* spp, *Schwanella* spp. Isolates were multi drug resistant and showed sensitivity to Cefoperazone-Sulbactam, Piperacillin-Tazobactam, Carbapenems and Colistin. Infections were more with male sex, prolonged catheterization, old age and diabetes. High incidence of CAUTI was found in the first 2 weeks of catheterization. The antimicrobial susceptibility pattern confirmed that most of the urinary isolates in our environment are resistant to the commonly used antibiotics.

Introduction

Catheter associated urinary tract infection is a leading cause of morbidity and mortality in hospitalized patients. When left in place for too long or used inappropriately, it is a hazard to the very patient that it is designed to protect.[17, 15]

According to 2009 International practice guidelines of Infectious Diseases Society of America, CA-UTI in patients with indwelling urethral, indwelling suprapubic, or intermittent catheterization is defined by the presence of symptoms or signs compatible with UTI with no other identified source of infection along with $\geq 10^3$ colony forming units (cfu/ml) of ≥ 1 bacterial species in a single catheter urine specimen or in a mid stream voided urine specimen from a patient whose urethral, suprapubic or condom catheter has been removed within the previous 48 hours.[10]

Patients in the Intensive care units are at high risk of device associated infection due to underlying conditions and impaired host defenses, surgery and invasive medical procedures[6].Indwelling urinary and central venous catheters are used commonly in the care of critically ill patients. Though important clinical benefits are provided by both types of devices, they are also the leading causes of nosocomial infection in the intensive care units[14]

UTI's were the third most common type of infection which occurs in ICU'S after pneumonia and lower respiratory tract infections. UTI's occurring in ICU's comprises 8% to 21% of all nosocomial infections. Because patients in ICU's require frequent and careful monitoring of intake and output and many of them use urinary catheter, the risk of UTI is significantly higher than in other patient populations[5]

Approximately 97% of UTI's in the ICU are associated with an indwelling urinary catheter. Because most patients admitted to ICU's have complications that are significant and are sicker than other patients, the effects of CA-UTI are more critical [5]

Patients in the intensive care unit are at a higher risk of device-associated infection, due to their impaired host defences, underlying conditions, surgery, and invasive medical procedures.[7] Central role in the pathogenesis of CAUTI is played by presence of a biofilm.[6] CAUTIs are cause for concern because catheter-associated bacteriuria comprises a huge reservoir of resistant pathogens in the hospital environment [6] and an important goal of health- care infection prevention programmes is prevention of infections attributable to these devices.[14]

CA-UTI are caused by a variety of pathogens, which includes Gram negative bacilli like *E. coli, Klebsiella spp, Pseudomonas aeruginosa.*

Up to 25% of patients who require a urinary catheter ≥ 7 days develop Nosocomial bacteriuria with a daily risk of 5%[15]. Bacteriuria develops at an average rate of 3% to 10% per day of catheterization.[4]Many of these microorganisms belong to the patient's endogenous bowel flora but they can also be acquired from other patients or hospital personnel by cross-contamination or by exposure to contaminated solutions or non-sterile equipment.[12]

CAUTIs are a cause of concern because catheter- associated bacteriuria comprises a huge reservoir of resistant pathogens in the hospital environment.[7] The epidemiology, frequency, microbiological spectrum and antimicrobial resistance patterns of microorganisms causing Device-Associated Infections vary among institutions and can change yearly. Multidrug resistant pathogen infection are on the rise, which further complicates the management of these infections.[6] Documented phenomena include the emergence of extended spectrum beta lactamase producing *E. coli.*[4]

In healthy patients CA-UTI is often asymptomatic and is likely to resolve spontaneously with removal of the catheter. Infection persists occasionally and leads to complications such as prostatitis, epididymitis, cystitis, pyelonephritis and gram negative bacteremia particularly in high risk patients. The last complication is serious since it is associated with a significant mortality but fortunately occurs in less than 1% of catheterized patient's.[12]CA-UTI is the second most common cause of nosocomial blood stream infection.[13]

The vast majority of nosocomial UTIs occur in patients whose urinary tracts are currently

or recently catheterized. The duration of catheterization is the most important risk factor for the development of CA-bacteriuria. Other risk factors for CA-bacteriuria include the lack of systemic antimicrobial therapy, female sex, meatal colonization with uropathogens, microbial colonization of the drainage bag, catheter insertion outside the operating room, catheter care violations like improper position of the drainage tube (above the level of the bladder or sagging below the level of collection bag), absence of use of a drip chamber, rapidly fatal underlying illness, older age, diabetes and elevated serum creatinine at the time of catheterization.[9, 15]

Most episodes of bacteriuria in short term catheterized patients are caused by single organisms, mostly *E. coli* and *Klebsiella* spp. *E coli* cause most of the infections

Biofilm formation by uropathogens like *Klebsilla pneumoniae* is favoured by presence of indwelling urinary catheters by providing an inert surface for the attachment of bacterial adhesins, which enhances colonization by microbes and helps in the development of biofilm. Attachment of biofilms to catheters is initiated by adhesins, for example, fimbriae, located on the bacterial surface. The best understood *K. pneumoniae* fimbrial types that are also the most frequently encoded are fimbriae type 1 fimbriae and type 3 fimbriae. Type 1 fimbriae are encoded by the majority of *Enterobactericeae* and it was established that type 1 fimbriae are essential for the ability of *K. pneumoniae* to cause urinary tract infections.[8]

The virulence of *Pseudomonas aeruginosa* is multifactorial and the cell associated factors responsible for its virulence are alginate, lipopolysaccharide, flagellum, pilus, non-pilus adhesions, exoenzymes and secretory virulence factors like elastase, protease, phospolipase, pyocyanin, exozyme S, exotoxin A, hemolysins and siderophores. *Pseudomonas* also shows tendency to form biofilms on the surface of urinary catheters in addition to these virulence factors.[13]

The risk of UTI increase with duration of catheterization and the Acute Nosocomial UTI is usually asymptomatic[7]

CA-UTI induced signs and symptoms include new onset of worsening of fever, rigors, malaise or lethargy, with no other identified cause, altered mental status, flank pain, tenderness of the costo- vertebral angle, acute hematuria, pelvic discomfort, and dysuria, urgent or frequent urination, or suprapubic pain or tenderness in those whose catheters have been removed.[10] In patients with spinal cord injury (SCI), increased spasticity, autonomic dysreflexia or sense of unease are also compatible with CA-UTI.[9]

Although recommendations have been made to treat CAUTI's only when they are symptomatic. The CAUTI associated symptoms have not been clearly defined and unrelated to CAUTI, the presence of an indwelling urinary catheter alone can cause dysuria or urgency.[16]

Materials and Methods

On approval from ethical committee, in our study 100 in-patients of Intensive care units were analysed for a period of 1 year from December 2012 to November 2013 in Microbiology department at Sree Gokulam Medical College and Research Foundation.

The sample included admitted Patients with indwelling catheter of either sex and above 19 years of age of all intensive care units of Sree Gokulam Medical College and Research Foundation. The samples of Patients with confirmed urinary tract infection before catheterization, patients whose lab culture

reported as mixed flora' Urinary catheter tips' Urine from catheter bags were excluded.

Samples of urine after insertion of catheters will be collected aseptically within 2 hours from the time of insertion for baseline urine cultures and microscopic examination. Thereafter urine cultures and urine analysis will be done on the 3rd day, 5th day, 7th, until Catheter is removed or significant bacteriuria occurred on two consecutive cultures or patient is discharged, whichever comes early. Minimum three samples will be collected from each individual. Urine samples will be collected by aspirating urine from the Foley's catheter with sterile syringe with gauge 26 needle after disinfecting the catheter with 70% alcohol.

The samples are transported to the Microbiology laboratory immediately. If there is a delay of >2 hours, sample is refrigerated at $4^{o}C$[9]. Wet film microscopy and urine cultures will be done.

A colony count of $\geq 10^3$ CFU/ml is considered positive. All the isolates were identified by standard procedures and biochemical tests and antimicrobial susceptibility test was done for pathogens isolated, by Kirby-Bauer disc diffusion technique.

The antibiotic discs used were from Himedia and the discs used were Ampicillin (10µg) Amoxyclav (20/30µg), Cephalexin (30µg), Cefuroxime (30µg), Ceftazidime (30µg), Cefotaxime (30µg), Cefipime (30µg), Gentamicin 10µg), Netilmicin (30µg), Amikacin (30µg), Cotrimoxazole (1.24/23.75µg) Nitrofurantoin (300µg), Ciprofloxacin (5µg), Norfloxacin (10µg), Ofloxacin (10µg), Tetracycline (30µg), Piperacillin (100µg), Aztreonam (30µg), Cefoperazone Sulbactam, Piperacillin Tazobactam (100/10µg), Imipemen (10µg), Meropenem (10µg) Colistin (10µg), Cefoxitin. The antibiotic susceptibility was interpreted as sensitive, intermediate or resistant by comparing the observed zone of inhibition of the test organisms to the required zone size for the Standard strains as per CLSI Guidelines.

Results and Discussion

The results obtained are as follows:

Out of 100 samples collected, 56 samples were collected from MICU, 24 from SICU, 12 from NSICU, 7 from POICU and 1 from CCU respectively.

Total numbers of samples collected in the study were 100. Among them 45 samples were from male patients and 55 samples were from female patients.

Among 100 samples collected 26 samples were culture positive showing growth, 74 samples were culture negative showing no growth.

Total number of patients catheterized for one week were 43, and the growth observed among this 43 was 3.Total number of patients who were catheterized for upto two weeks was 36, among the 36 growth observed was 6. Out of the 15 patients catheterized for up to 3 weeks growth observed was 11 and 6 patients catheterized for ≥ 4 weeks all of them developed CA-UTI.

Out of the 26 culture positive samples, 15(57%) were from MICU, 4(15%) were from SICU, 3 (11%) were from NSICU, 2 (7%) were from POICU and CCU. The highest percentage of growth was found in Medical ICU.

Out of 45 samples collected from males 18 (40%) were culture positive. Out of the 55 samples collected from females 8 (14.5%) were culture positive.

Out of the 26 gram negative bacilli isolated, 11 (42.3%) were *E. coli*, 5 (19.2%) were *Klebsiella pneumoniae*, 5 (19.2%) were *Pseudomonas aeruginosa*, 2 (7.7%) were *Citrobacter freundi* and 1 (3.8%) each of *Enterobacter cloacae, Acinetobacter spp, Schewanella algae* respectively.

Percentage of *E. coli* isolated in our study was18.3%. *E. coli* showed highest rate of sensitivity to Imipenem (100%), lowest rate of sensitivity to Cephalosporins (27.3%) and Ampicillin (27.3%), and moderate rate of sensitivity to Aminoglycosides [Ak (63.6%), Gen (45.5%), Net (45.5%) respectively] and Fluoroquinolones (36.4%). About 54.5% were sensitive to Tetracycline and 72.7% were sensitive to Cefoperazone –Sulbactam and Piperacillin –Tazobactam.

Klebsiella Spp showed 100% sensitivity to Imipenem, Meropenem, Cefoperazone Sulbactam, and Piperacillin- Tazobactam. None were sensitive to Ampicillin (0%). It showed 40% sensitivity to Piperacillin, Amoxycillin-Clavalunic acid, Cephlexin, Cefuroxime, Ceftazidime, Cefotaxime, Cefipime, Aztreonam and Nitrofurantoin. Sensitivity to Tetracycline and Cotrimoxazole were 60%. Only 20% were sensitive to Fluoroquinolones.

The next predominant pathogen *Citrobacter freundi* isolated were 2 in number (3.3%), *Citrobacter freundii* isolated showed 100% resistance to Ampicillin, Amoxycillin-Clavalunic acid, Cephalexin and Cefuroxime. 50 % sensitivity was observed towards Cefotaxim, Ceftazidime and Cefipime, Aztreonam, Aminoglycosides and Fluoroquinolones and Tetracycline. No resistance was shown to Cefoxitine, and it was found to be 100% sensitive to Nitrofurantoin, Cotrimoxazole, Cefoperazone-Sulbactam, Piperacillin-Tazobactam, Imipenem, Meropenem.

Pseudomonas isolated showed 100% resistance to Piperacillin, Ceftazidime and Cefipime. It also showed 100% resistance to Fluoroquinolones and Aminoglycosides like Netilmycin and Amikacin, 40% of Pseudomonas was sensitive to Tobramycin and Piperacillin-Tazobactam (40%). 100% sensitive to Aztreonam, Imipenem, Meropenem and Colistin.

Only one *Acinetobacter* was isolated, It was a multidrug resistant strain, It showed complete resistance to all tested antibiotics except to Aztreonam, Imipenem, Meropenem and Colistin.

Among the 26 uropathogens only one *Enterobacter cloacae* was isolated. The isolate was sensitive to Nitrofurantoin, Cotrimoxazole, Tetracycline, Fluoroquinolones, Aminoglycosides, Piperacillin-Tazobactam, Cefoperazone-Sulbactam, and Carbapenems.

Lastly among the Gram negative bacilli one rare uropathogen *Schewanella algae* (1) was isolated. It was found to be sensitive to Nitrofurantoin, Cotrimoxazole, Ceftazadime, Tetracycline, Fluoroquinolones, Aminoglycosides, Piperacillin. Piperacillin-Tazobactam, Cefoperazone-Sulbactam, and Carbapenems.

In our study the percentage of ESBL among the *E. coli* was 36.4% and in *Klebsiella, Citrobacter* and they were 75%, and 50% respectively. No ESBL production was observed in *Enterobacter* Amp C production for *E. coli*, was 18.2%, whereas there was no Amp C production in *Klebsiella* and *Citrobacter.*

Urinary tract infections (UTIs) are commonly acquired in hospitals, representing 30% -40% of all nosocomial infections with an estimated prevalence of 1% to 10%.[12].Catheter-

associated urinary tract infections is the most common nosocomial infection and accounts for bacteremia in 2 to 4% of patients and the case fatality associated with it is three times as high as nonbacteriuric patients.[15] All age groups are affected by UTI and are diagnosed in both outpatients and hospitalized patients. It causes a serious burden on the socio economic life of individuals and leads to consumption of large population of all antibacterial drugs used in the world[6]. Among catheterized patients the reported incidence of CAUTI ranges from as low as 5% to as high as 73%.[4] In the present study, out of 100 cases studied, 26 % developed CAUTI and high incidence of CAUTI was found in the first two weeks of catheterization. This result is comparable with that of a study by Danchaivijitr *et al.,* [7]where one hundred and one patients met the inclusion criteria and the incidence of CAUTI was 73.3% and high incidence of CAUTI was found in the first two weeks of catheterization. None of the episodes of CAUTI in our study was associated with nosocomial bacteremia and prolonged catheterization was identified as a risk factor in the present study, also similar to the study by Danchaivijitr *et al.,*[7]

In most of the Indian studies and studies from abroad the most common organism was *E. coli*. [10, 11, 3] The major uropathogen isolated in our study was *E. coli* [18.3%]. This is in agreement with study by Danchaivijitr *et al.,* [3] in 101 catheterized patients where *E. coli* (15.1%) isolated. Whereas in an Indian study conducted by Manish *et al.,* [10] in 100 adult patients with an indwelling Foleys catheter the most common organism colonizing and causing catheter associated urinary tract infection was found to be *E. coli* (57%).

The percentage of *Pseudomonas aeruginosa* isolated in the present study was 8.3%. Other studies isolated *Pseudomonas aeruginosa* in the range of 2% [16] to 20.6%[11], whereas in a study by Dutta *et al.,* the commonest organism causing CAUTI was identified as *Pseudomonas aeruginosa*.

Klebsiella pneumoniae (8.3%), *Citrobacter freundii* (3.3%), *Acinetobacter* (1.7%) spp, *Enterobacter cloacae* (1.7%), *Shewanella algae* (1.7%) were the other uropathogens isolated in that order in our study.

Contrary to other studies in which CAUTI was prevalent in females in our study CAUTI was more prevalent in men. Out of 45 samples collected from males 18(40%) were culture positive. Out of the 55 samples collected from females 8 (14.5%) were culture positive.

Bacteria, which exist as a biofilm inside catheters, show higher antimicrobial resistance when compared to non-CAUTI pathogens[6]. In the present study *E. coli* showed highest rate of sensitivity to Imipenem (100%), lowest rate of sensitivity to Cephalosporins(27.3%) and Ampicillin(27.3%), and moderate rate of sensitivity to Aminoglycosides [Ak (63.6%), Gen (45.5%), Net (45.5%) respectively] and Fluoroquinolones (36.4%). About 54.5% were sensitive to Tetracycline and 72.7% were sensitive to Cefoperazone–Sulbactam and Piperacillin–Tazobactam.

Klebsiella pneumoniae isolated in our study is 8.3%. The other less predominant pathogens isolated in our study were *Citrobacter freundi* (3.3%), *Acinetobacter* spp (1.7%), *Enterobacter cloacae* (1.7%) and *Shewanella alga* (1.7%).

In our study out of the lesser common pathogens isolated *Citrobacter freundii* was 3.3% that is out of the 60 uropathogens only 2 were *Citrobacter freundii*. A similar observation was found in a study by Aravind *et al.,* [66] regarding device associated infections in which 1 *Citobacter freundii* was isolated among the five uropathogens causing CAUTI.[19] In our study *C. freundii* showed

100% resistance to Amoicillin, Amoxycillin-Clavalunic acid, Cephalosporins and 100% sensitivity to Nitrofurantoin, Cotrimoxazole, Cefoperazone-Sulbactam, Piperacillin-Tazobactam, Imipenem and Meropenem, We could not compare the sensitivity pattern with as other studies which reported their sensitivity pattern were rare. In our study out of the sixty uropathogens isolated only one *Acinetobacter* was isolated, It was a multidrug resistant strain and it showed resistance to Cephalosporins, Fluoroquinolones, Aminoglycosides, Piperacillin, Aztreonam and Piperacillin-Tazobactam whereas it showed sensitivity to Imipenem, Meropenem and Colistin. Similar to our study only 1% *Acinetobacter* was isolated in a study by Chaudhary *et al.,* and it was a strain sensitive to Amikacin alone.[10]

The rare pathogen isolated in our study i.e. *Shewanella alage,* which was a sensitive strain showing sensitivity to all the antibiotics used in the study. In our study among Gram negative fermenters the highest number of ESBL and Amp C producers belonged to *E. coli* (ESBL: 36.4%, AmpC: 18.2% followed by *Klebsiella* (ESBL: 75%, AmpC: 0%). Patil *et al.,* in his study observed that the percentage of ESBL production in *E. coli* causing UTI in patients with indwelling catheter was 20.68% and in *Klebsiella* it was 43.75%.[20] Several studies have reported the incidence of ESBL among pathogens causing urinary tract infections and it ranges from 34.8% to 64.2%[21, 22, 23] According to a study conducted by Talaat *et al.,* on surveillance of catheter-associated urinary tract infections in 4 intensive care units at Alexandra university hospitals in Egypt, The prevalence of ESBL producers among *K. pneumoniae* and *E. coli* isolates was 56% and 78.6% respectively (Table 1-10).

Table.1 Number of samples obtained from the various ICU's

I.C.U	NUMBER OF SAMPLES
MICU	56
SICU	24
NSICU	12
POICU	7
CCU	1
TOTAL	100

Table.2 Sex wise distribution

Number of males	45
Number of females	55
Total	100

Table.3 Samples showing growth

CULTURE POSITIVE	26
CULTURE NEGATIVE	74
TOTAL	100

Table.4 Association between the duration of catheterization and catheter- associated urinary tract infection

Duration of Catheterization	Total no: of patients catheterized	Growth seen
1 week	43	3
2 week	36	6
3 week	15	11
≥4 week	6	6

Pearson ChiSquare value: 32.47, p value< 0.001

Table.5 Percentage prevalence of catheter-associated urinary tract infections in the various ICUs of a tertiary care hospital

ICU	CULTURE POSITIVE [%]
MICU	15(57%)
SICU	4(15%)
NSICU	3(11%)
POICU	2(7%)
CCU	2(7%)
TOTAL	26

Table.6 Sex wise distribution of positive cultures

SEX	CULTURE NEGATIVE	CULTURE POSITIVE
	No: (%)	No: (%)
MALES	27(60%)	18 (40)
FEMALES	47(85.5%)	8 (14.5)

Pearson Chi Square value: 4.209, $p < 0.05$

Table.7 Gram negative bacilli isolated

GNB	Number[%]
E. coli	11(42.3%)
Klebsiella spp	5(19.2%)
Citrobacter freundi	2(7.7%)
Enterobacter cloacae	1(3.8%)
P. aeruginosa	5(19.2%)
Acinetobacter spp	1(3.8%)
Schewanella algae	1(3.8%)
TOTAL	26

Table.8 Antibiotic susceptibility pattern *of E. coli, Klebsiella pneumoniae* and *Citrobacter freundii*

	Escherichia coli (n=11)		*Klebsiella pneumoniae* (n=5)		*C.freundii* (n=2)	
Antibiotics	S	R	S	R	S	R
AMP	3(27.3%)	8(72.7%)	0 (0%)	5(100%)	0(0%)	2(100%)
PP	3(27.3%)	8(72.7%)	2 (40%)	3 (60%)	1(50%)	1(50%)
AMC	3(27.3%)	8(72.7%)	2 (40%)	3 (60%)	0(0%)	2(100%)
CEPH	3(27.3%)	8(72.7%)	2 (40%)	3 (60%)	0(0%)	2(100%)
CXM	3(27.3%)	8(72.7%)	2 (40%)	3 (60%)	0(0%)	2(100%)
CTX	3(27.3%)	8(72.7%)	2 (40%)	3 (60%)	1(50%)	1(50%)
CAZ	3(27.3%)	8(72.7%)	2 (40%)	3 (60%)	1(50%)	1(50%)
CPM	6(54.5%)	5(45.5%)	2 (40%)	3 (60%)	1(50%)	1(50%)
CX	8(72.7%)	3(27.3%)	5 (100%)	0 (0%)	0(0%)	2(100%)
AT	7(63.6%)	4(36.4%)	2 (40%)	3 (60%)	1(50%)	1(50%)
GEN	5(45.5%)	6(54.5%)	1(20%)	4(80%)	1(50%)	1(50%)
NET	5(45.5%)	6(54.5%)	3(60%)	2(40%)	1(50%)	1(50%)
AK	7(63.6%)	4(36.4%)	3(60%)	2(40%)	1(50%)	1(50%)
NX	4(36.4%)	7(63.6%)	1(20%)	4(80%)	1(50%)	1(50%)
CIP	4(36.4%)	7(63.6%)	1(20%)	4(80%)	1(50%)	1(50%)
OF	4(36.4%)	7(63.6%)	1(20%)	4(80%)	1(50%)	1(50%)
NITRO	6(54.5%)	5(45.5%)	2 (40%)	3 (60%)	2(100%)	0(0%)
COT	6(54.5%)	5(45.5%)	3(60%)	2(40%)	2(100%)	0(0%)
T	6(54.5%)	5(45.5%)	3(60%)	2(40%)	1(50%)	1(50%)
CS	8(72.7%)	3(27.3%)	5(100%)	0(0%)	2(100%)	0(0%)
PT	8(72.7%)	3(27.3%)	5(100%)	0(0%)	2(100%)	0(0%)
MRP	11(100%)	0 (0%)	5(100%)	0(0%)	2(100%)	0(0%)
IMP	11(100%)	0(0%)	5(100%)	0(0%)	2(100%)	0(0%)

Table.9 Percentage of ESBL and AMPc among Enterobactericiae in the various ICU's

GNB	No: isolated	ESBL	AmpC
		NO: (%)	NO:(%)
E. coli	11(18.3%)	4(36.4%)	2(18.2%)
Klebsiella	5(8.3%)	3(75%)	0(0%)
Citrobacter	2(3.3%)	1(50%)	0 (0%)
Enterobacter	1(1.7%)	0(0%)	0(0%)

Table.10 Antibiotic susceptibility pattern of *Pseudomonas aeruginosa* and *Acinetobacter* species isolated

	Pseudomonas aeruginosa (n=5)		*Acinetobacter spp. (n=1)*	
Antibiotics	S	R	S	R
PP	0(0%)	5(100%)	0 (0%)	1(100%)
CAZ	0(0%)	5(100%)	0(0%)	1(100%)
CPM	0(0%)	5 (100%)	0(0%)	1(100%)
GEN	0(0%)	5(100%)	0(0%)	1(100%)
TOB	2(40%)	3(60%)	0(0%)	1(100%)
NET	0(0%)	5(100%)	0(0%)	1(100%)
AK	0(0%)	5(100%)	0(0%)	1(100%)
CIP	0(0%)	5(100%)	0(0%)	1(100%)
NOR	0(0%)	5(100%)	0(0%)	1(100%)
OF	0(0%)	5(100%)	0(0%)	1(100%)
CS	____	____	1(100%)	0(0%)
PT	2(40%)	3(60%)	0(0%)	1(100%)
AT	5(100%)	0(0%)	1(100%)	0(0%)
IMP	5(100%)	0(0%)	1(100%)	0(0%)
MRP	5(100%)	0(0%)	1(100%)	0(0%)
CL	5(100%)	0(0%)	1(100%)	0(0%)
TIGE	____	____	1(100%)	0(0%)

In conclusion, all health care associated UTI are caused by instrumentation of the urinary tract. The incidence of CAUTI in the present study was 26%.The incidence was more in males and risk factors identified were prolonged catheterisation, old age and diabetes mellitus.

High incidence of CAUTI was found in the first 2 weeks of catheterisation. Longer duration of catheterization increases the chances of CAUTI.

The most common organism associated was *E. coli* [18.3%] and *Pseudomonas aeruginosa* [8.3%], *Klebsiella* spp (8.3%). Hospital acquired CAUTI is often due to multi drug resistant strains which require higher antibiotics and these strains may spread to other patients. Gram negative organism showed high degree of sensitivity to Cefoperazone-Sulbactam, Piperacillin-Tazobactam, Carbapenems, and Colistin whereas high resistance was observed for Ampicillin, Amoxycillin-Clavalunic acid, Cephalosporins, Aminoglycosides and Fluoroquinolones and moderate sensitivity was observed for Nitrofurantoin, Cotrimoxazole and Tetracyclines. The antimicrobial susceptibility pattern confirmed that most of the urinary isolates in our environment are resistant to the commonly used antibiotics including cephalosporins and fluoroquinolones. Effective infection prevention measures should be in place to reduce the prevalence of nosocomial UTIs. Better management of urinary catheter is to be explored and implemented.

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